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GOULD
Electronics

Manual Part No.
MU42-8240-10

OCT 27 1992

EasyGraf Recorder
TA240
USER'S MANUAL
Models
42-8240-10 and 42-8240-40

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SAFETY SUMMARY

The general safety information is for both user and service personnel. Specific **WARNINGS** and **CAUTIONS** will be found throughout the manual where they apply.

TERMS IN THIS MANUAL

CAUTION statements identify conditions or practices that could result in damage to the equipment or other property. They will appear in boldfaced capital letters.

WARNING statements identify conditions or practices that could result in personal injury or loss of life. They will appear in boldfaced capital letters.

SYMBOLS IN THIS MANUAL

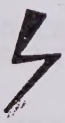
This symbol indicates where cautionary information is to be found.

TERMS AS MARKED ON EQUIPMENT

CAUTION indicates a personal injury hazard not immediately accessible as one reads the marking, or a hazard to property, including the equipment itself.

DANGER indicates a personal injury hazard immediately accessible as one reads the marking.

SYMBOLS AS MARKED ON EQUIPMENT



DANGER - High Voltage.

Protective ground (earth) terminal.

ATTENTION - Refer to manual.

POWER SOURCE

This instrument is intended to operate from a power source that does not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the power cord is essential.

GROUNDING THE INSTRUMENT

This instrument is grounded through the grounding conductor of the power cord. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

DANGER ARISING FROM LOSS OF GROUND

Upon loss of the protective-ground connection, all accessible conductive parts (including knobs and controls that may appear to be insulating) can render an electric shock.

USE THE PROPER POWER CORD

Use only the power cord and connector specified for your instrument. Use only a power cord that is in good condition. For detailed information on power cords and connections see Section 2, Installation, in the User's Manual.

USE THE PROPER FUSE

Use only a fuse of the correct type, voltage rating and current rating as specified in the parts list for your instrument.

DO NOT OPERATE WITHOUT COVERS AND PANELS INSTALLED

Disconnect power before removing covers, panels or any grounding straps. Reinstall covers, panels and any grounding straps *before* reconnecting power.

WARNINGS FOR AUTHORIZED SERVICE PERSONNEL

Dangerous voltages exist at several points in this instrument. To avoid personal injury, do not touch exposed connections or components while power is on.

Disconnect power before removing protective panels, soldering, or replacing components.

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GENERAL INFORMATION

SCOPE OF MANUAL

This manual contains valuable information on the installation, operation, and maintenance of the TA240 Recorder. Knowledge of the contents of this manual will help the user maximize all the features the Recorder has to offer. The user is urged to read through this publication and familiarize himself with the operation of the TA240 . A service manual is available for purchase. It contains information needed to service the recorder. Contact your local Gould Service Representative to obtain the service manual.

While this manual contains information on the installation of the signal conditioners into the TA240 Recorder; operating instructions for the signal conditioners, which are part of the system, have their own user's manuals.

DESCRIPTION

The EasyGraf Recorder, TA240, is a two channel thermal array recorder expandable to four channels. There are two EasyGraf models. The 42-8240-10 Model can be operated at one of four AC voltages at 50/60 Hertz: 100/120/220/240 volts ±10%. The 42-8240-40 can also operate at one of the above four voltages at 50 or 60 Hertz but also includes a frequency range of 400 Hertz.

An internal DC power supply (with protection fuse) is standard and accepts 10 to 30 volts DC at 15 amps peak. An optional DC battery pack is also available which is rechargeable by DC voltages from 12 to 28 volts or through the recorder.

Four grid types are offered: one, two and four grid areas, and none. The TA240 provides two bi-directional event markers and two unidirectional markers (in the two and four grid area types only). Chart annotation consists of chart speed, time and date, signal conditioner status, identification number (a five number character set) and page number (page "300" starting when paper compartment door is closed and counts down).

The TA240 also contains an internal timer and clock (printed as hours, minutes, seconds, day, month and year). (The clock and I.D. number have a battery backup.) There is an LED array for trace position for each active analog channel.

Selectable Inputs

The TA240 Recorder uses the 6600 Series Signal Conditioners as plug-in modules that can provide functions such as input-to-output isolation, full scale selection, zero suppression (DC offset), AC and DC coupling and on/off filter selection. The DC (direct coupling) signal conditioner accepts any DC or AC voltage, attenuates or amplifies and offsets it as desired.

Front Panel Controls

A push button turns power on and off whether the recorder is operating on AC or DC. All chart speed controls (1, 5, 10, 25, 50, 100 mm/sec and Stop) are easily accessible from the front panel. A remote stop input is available at the 15-pin D Connector on the back panel of the recorder. There are also divide-by 60 and 100 keys which permit conversion to mm/minute and to speeds as low as 0.01 mm/sec. Left and right manual channel markers are activated by pushbuttons on the front panel.

Setup functions which do not require frequent use are located behind a small panel door which prevents accidental input (see Figure 2-1 in the Installation Section). These setup functions include selecting grid; turning on and off event markers, displaying timing marks, turning annotation on and off; selecting a numerical identification number; and setting the time and date. The identification number, time and date can be reviewed in the display window on the recorder's front panel.

Chart Paper

The recorder paper (Gould Part Number CL-213688) is available in Z-fold packs of 45 meters (148 feet). The page size if 120 mm x 152 mm (4.73 inches by six inches) with a total of 300 pages. The recorder comes standard with an output paper catch tray.

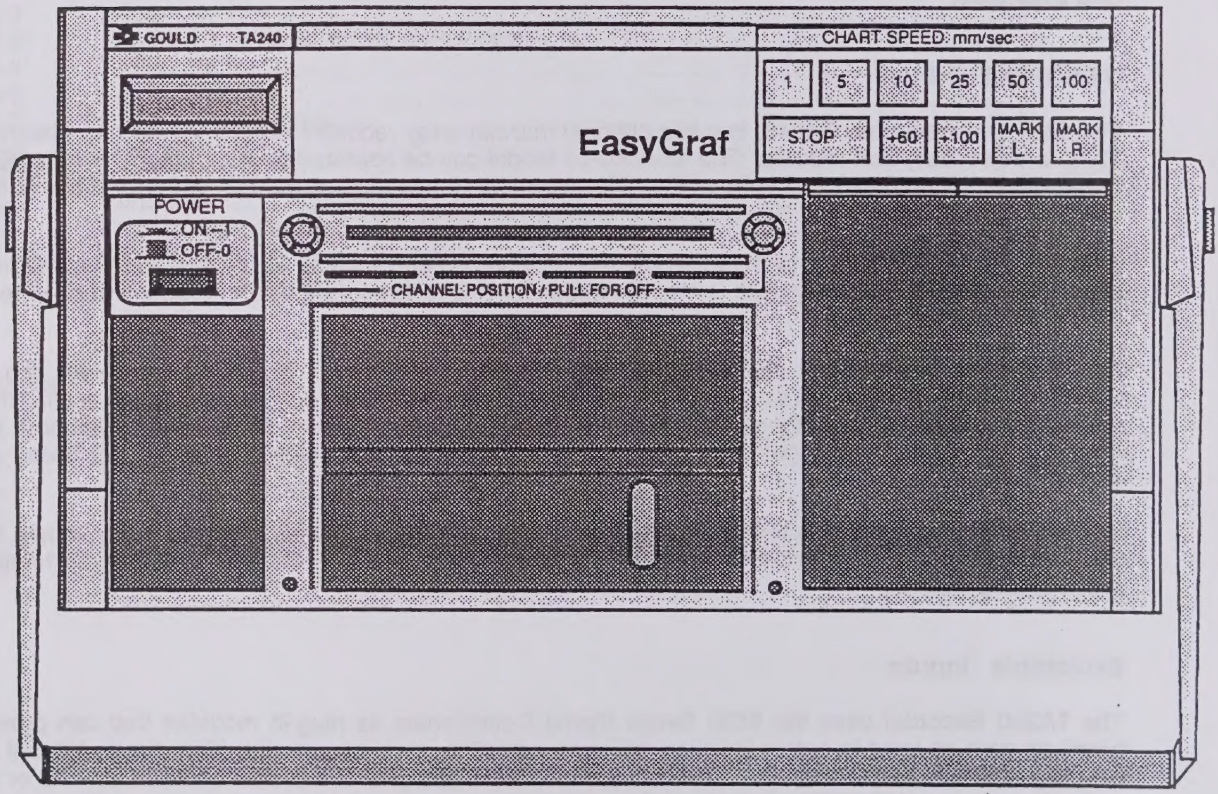

FIGURE 1-1
EasyGraf Recorder, TA240

INSTALLATION

GENERAL DESCRIPTION

This section contains information necessary to put the TA240 Recorder into service, including installation of signal conditioners. Refer to Figure 2-1 for a review of the major components in the system.

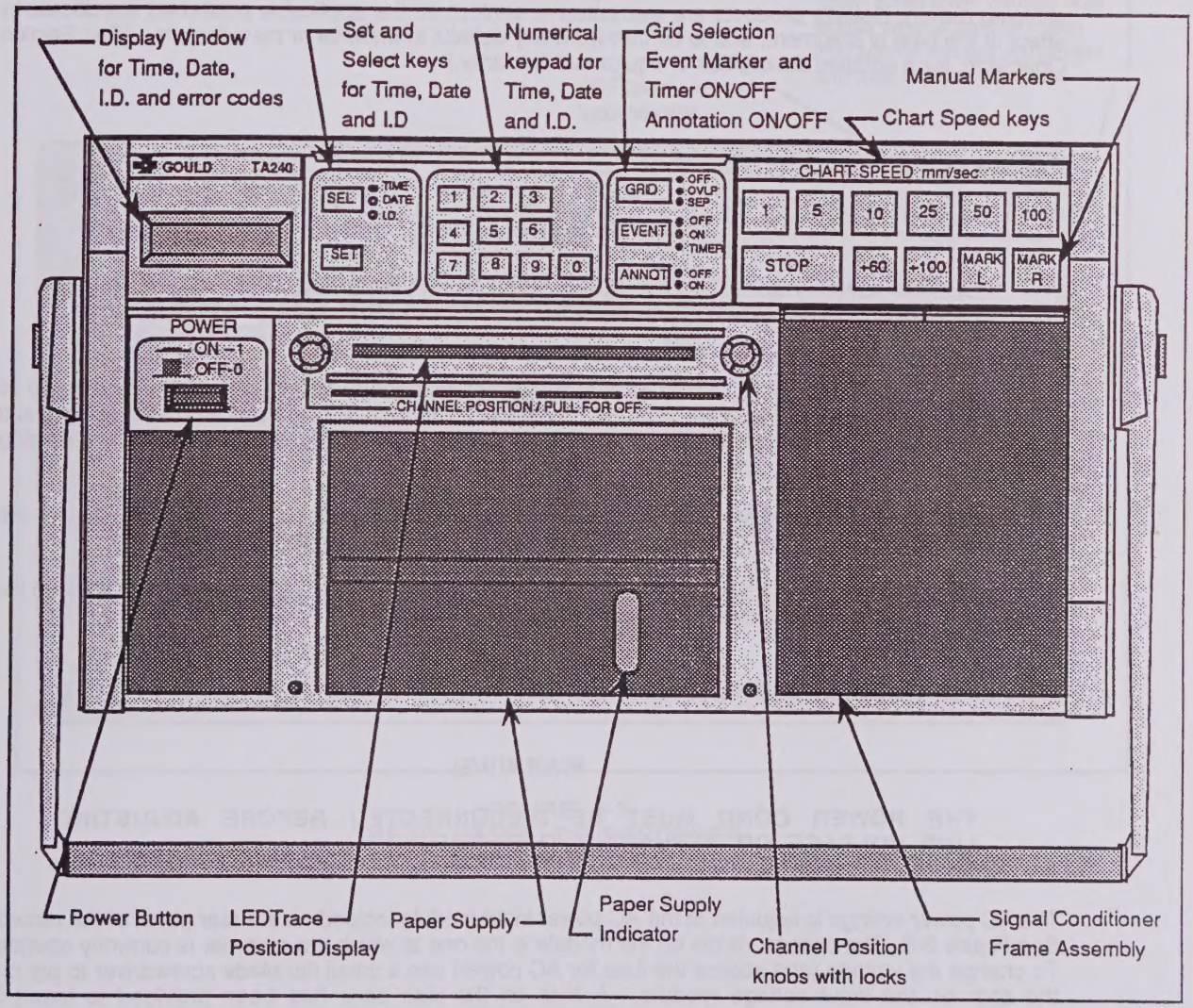

FIGURE 2-1
TA240 RECORDER

The paragraphs in this section describe the procedures for connecting power to the unit and installing the signal conditioners into the recorder and loading chart paper. It also provides instructions for the power requirements for the recorder and changing the fuse. All the instructions in this section should be completed before beginning the operating procedures in Section 3, Operation. Should an error code (e.g. "E 0001") appear on the display window after power-up, refer to Appendix B for an explanation of the code.

INITIAL INSPECTION

Before making any electrical connections or attempting operation, visually examine the system for broken or loose panels, dented or nicked panels and broken or chipped connectors at the rear of the recorder. Make sure you read the Concealed Damage Card (Form Number 222640) which is enclosed in the shipping carton. Gould's products are warranted to conform to the applicable published specifications in effect at the time of shipment, and to be free from any defects in material or manufacture. (See Section 3, Operation, for a detailed description of equipment warranty.)

POWER LINE REQUIREMENTS

CAUTION:

CHECK LINE VOLTAGE TO MAKE CERTAIN THAT FACTORY SETTING IS CORRECT FOR YOUR OPERATION. SEE INSTRUCTIONS BELOW.

The TA240 Recorder can be operated at one of four AC voltages (50/60 Hertz): 100/120/220/240 volts ±10%. See the procedure below for setting the voltage. The recorder has a 4 amp 250 volt protection fuse for the AC line voltage which is located on the rear panel. (Instructions below detail the changing of this fuse.)

An internal DC power supply (with protection fuse) is standard and accepts 10 to 30 volts DC at 15 amps peak. Refer to paragraphs on DC voltage for connections and fuse changing instructions.

An optional DC battery pack is also available and is rechargeable with DC voltages from 12 to 28 volts (refer to paragraphs below on DC Battery Pack) for the through the recorder.

AC Power Selection and Fuse Change

WARNING:

THE POWER CORD MUST BE DISCONNECTED BEFORE ADJUSTING LINE VOLTAGE OR REPLACING THE FUSE.

The AC power voltage is adjusted at the AC power input module located on the rear panel of the recorder. See Figure 2-2. The voltage visible on the module is the one at which the recorder is currently operating. To change the voltage (and access the fuse for AC power) use a small flat blade screwdriver to pry open the door on the input voltage module. A hole on the side case has been provided to insert the screwdriver and access the lip of the door. After opening the module door remove the voltage switch drum from the power input module. See Figure 2-3. Turn the drum to the desired voltage and reinsert into the module. Note that the desired voltage should be visible when the input module door is closed.

To change the fuse, remove the fuse cartridge from the input module (see Figure 2-3). Remove the fuse from the cartridge and replace it with a 4 amp, 250 volts time delay metric fuse (5 x 20 mm). Install the fuse in the cartridge and insert the cartridge in the lower compartment. Do not install the fuse cartridge in the upper compartment which will render the recorder inoperable.

To complete the power line requirements, plug one end of the power cord into the AC power input module. Plug the other end into an AC outlet. The recorder is now ready to be powered on.

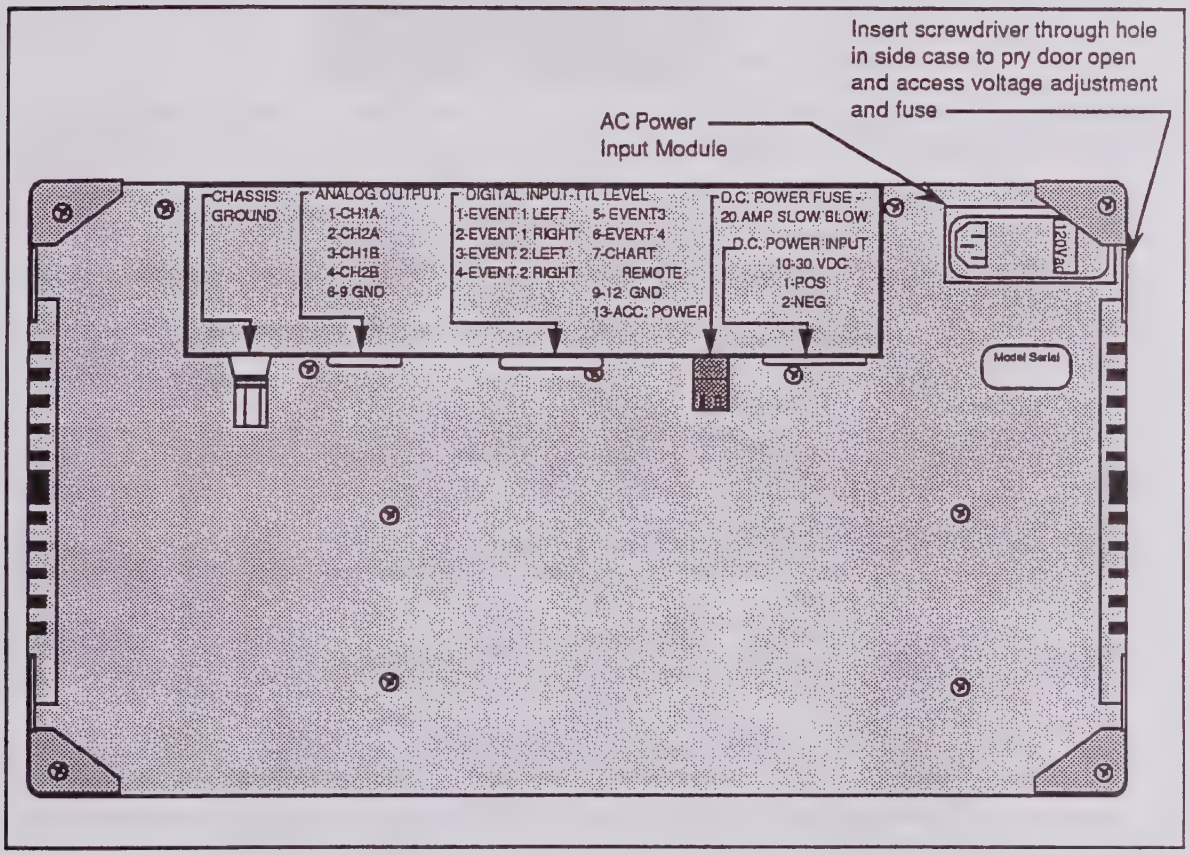

FIGURE 2-2
REAR PANEL OF RECORDER

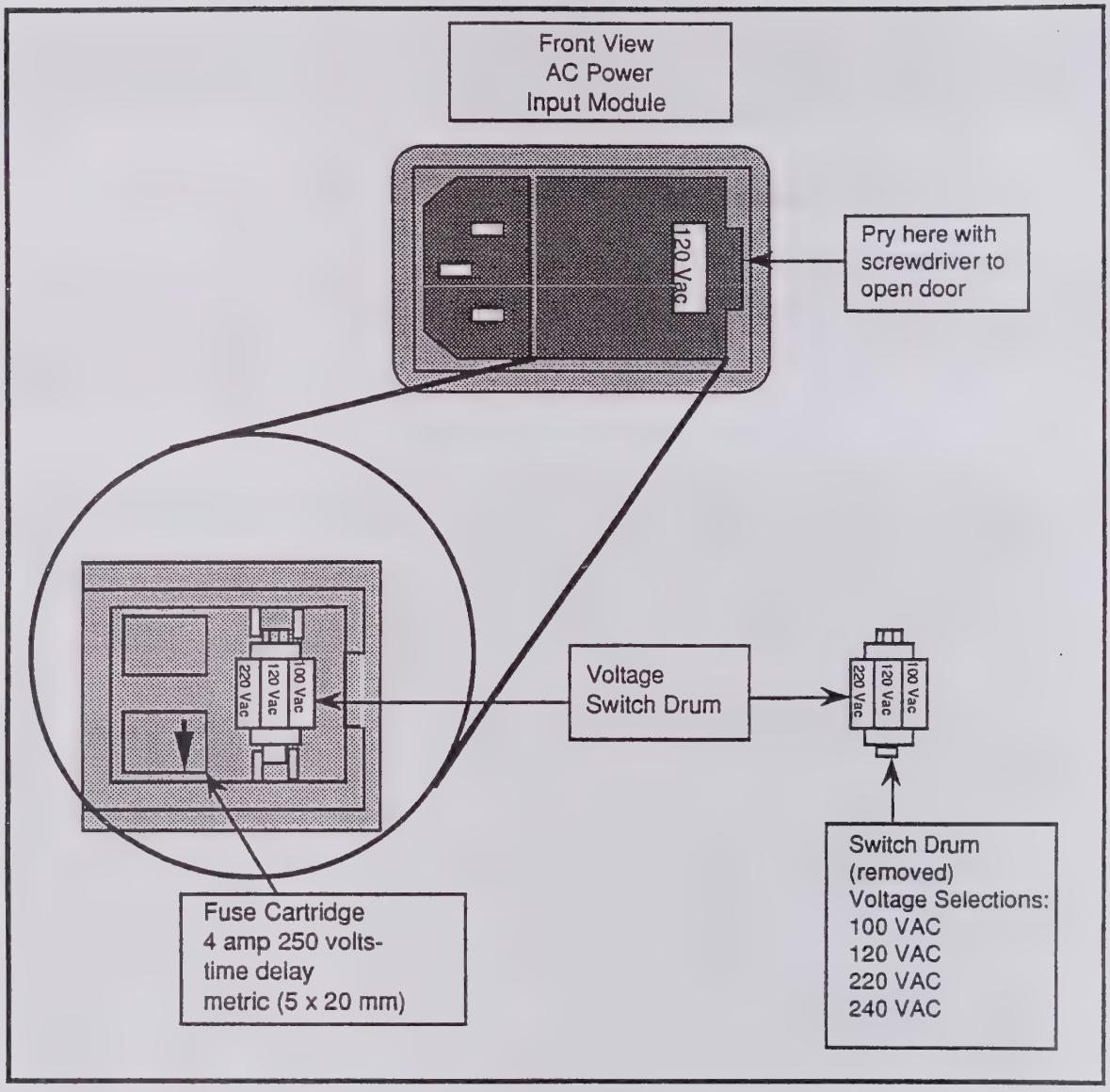

FIGURE 2-3
VOLTAGE ADJUSTMENT AND
FUSE CHANGE

DC Power Supply and Fuse Change

A DC power supply of 10 to 30 volts at 15 amps peak is standard on the recorder. Minimum DC input start-up voltage is 11.0 volts. (Once started, the unit will operate at its full specified range of 10 to 30 volts.) To connect the recorder to a DC power supply, plug the DC connector (see Figure 2-4) provided with the recorder into the connector labelled "D.C. POWER INPUT" (see Figure 2-2). Do not connect any voltages to Pin 3 of the connector as this pin is used to supply 26 volts to the Battery pack option.

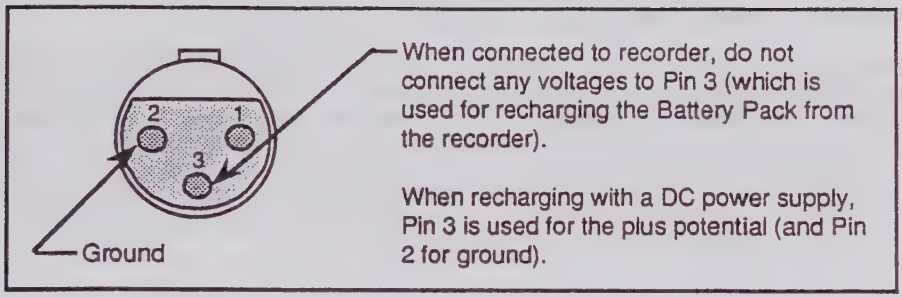
2
1
3
Ground
When connected to recorder, do not connect any voltages to Pin 3 (which is used for recharging the Battery Pack from the recorder).
When recharging with a DC power supply, Pin 3 is used for the plus potential (and Pin 2 for ground).

FIGURE 2-4
DC BATTERY PACK CONNECTOR (Front View)

To change the fuse for DC power remove the fuse holder from the rear panel by unscrewing it counterclockwise. Remove the fuse from the holder and replace it with a 20 amp 125 volt time delay 3 AG (1/4" x 1 1/4") fuse. Reinstall the holder into the rear panel.

DC Power Battery Pack (Gould P/N 814224)

The TA240 Recorder can also operate by DC power with the Gould optional battery pack. The battery pack offers five hours of operation at normal operating conditions. It is automatically recharged when the recorder is connected to AC power (see above paragraphs). Three LEDs reflect operating status of the unit: green that the battery pack is fully charged at 100%; amber indicates the battery is charging; red that the charge is below 40%.

To install the battery pack on the recorder, remove the connector from the clamp on the back of the battery pack (see Figure 2-5) and plug it into the connector labelled "DC Power Input" at the rear of the recorder. See Figure 2-2. Position the battery pack at the rear of the recorder and insert the two mounting pins into the two holes at the rear of the recorder. Close the battery support against the rear of the recorder and secure the battery pack by tightening the locking knob. The battery pack is now ready for operation. The two LEDs on the top of the pack indicate the operating and charging status of the battery.

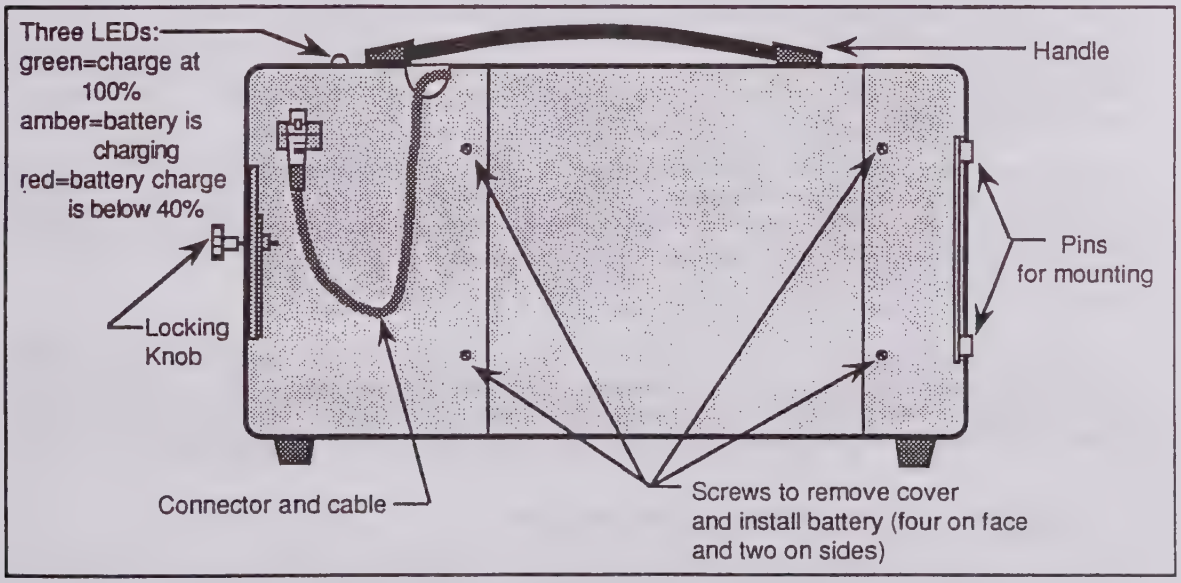
Three LEDs:
green=charge at 100%
amber=battery is charging
red=battery charge is below 40%
Handle
Pins for mounting
Locking Knob
Connector and cable
Screws to remove cover and install battery (four on face and two on sides)

FIGURE 2-5
BATTERY PACK OPTION

Recharging the Battery Pack

The battery pack has an average life of five hours under normal operating conditions. Some factors which effect the usuable capacity of the battery include waveform frequency and temperature (at 0°C usuable capacity is 80%). Battery life also depends greatly on the number of deep discharges, i.e., how many times the battery goes beyond its 0% capacity of 12.0 volts (12.6 volts=100%;12.24 volts=40%). In DC operation, the green LED indicates the battery is fully charged to 100%; the amber LED lights when the battery is charging; and the red is lit when the battery is below 40%. It is recommended that the battery be recharged before storage and charged periodically during storage, approximately once every three months. For optimal battery life, recharge the battery after each use.

There are three methods by which the battery pack can be recharged: the first is through the recorder itself; the second via a DC power supply; and the third with the Gould External Battery Charger. All three methods optimize the life of the battery pack.

Recorder Recharging

The Battery Pack is recharged through the recorder by simply plugging the Battery Pack connector (see Figure 2-5) into the connector labelled "DC PWR INPUT" at the rear of the recorder (see Figure 2-2). The recorder must be plugged into an AC outlet using the AC Power connector at the rear of the recorder (and the power cord shipped from the factory in the recorder's front cover). The power to the recorder must be turned ON by pressing the POWER button (see Figure 2-1). The amber LED on the battery pack indicates the battery pack is charging; the green LED indicates the charge is at 100%.

Recharging with DC Power Supply

The Battery Pack can be recharged using an external/commercial DC power supply of 28 volts ±10% with a peak current capability of 2.5 amps. Using the connector shipped with the battery pack, connect the plus potential to Pin 3 and ground to Pin 2. See Figure 2-4. The amber LED on the battery pack indicates the battery pack is charging; the green LED indicates the charging is completed.

Recharging with Gould External Battery Charger [Part No. CL-714591)

To recharge the Battery Pack with the Gould External Battery Charger, make certain the power line voltage on the Charger is correctly set. The switch for the 115/230 VAC is located on the bottom of the unit. A small slotted screwdriver can be used to change the voltage setting from the current one which is visible on the switch. Plug the 3-pin connector of the charger into the cable connector of the Battery Pack. Plug the other connector of the Charger into a standard AC outlet. (The power cord is wired to meet the CCE color code standard.)

The Battery Charger charges the Battery Pack at a 2 amp maximum rate and will charge a completely discharged battery pack in 8 to 10 hours. The charger will then maintain a floating voltage indefinitely without damaging the Battery Pack. The red LED on top of the unit indicates the charger is charging when lit; when the LED goes out, the battery is completely charged.

Changing the fuse for the Battery Pack

The Battery Pack contains a 20 amp 32 volt time delay fuse located inside the pack on the printed circuit board. To access the board remove four screws from the inside panel (side where the battery cable and connector is located) and four from the sides (two on each side). Remove the fuse labelled "F1" from the board and replace it with a 1/4" by 1 1/4" fuse. Reinstall the panel and the eight screws.

PROTECTIVE EARTH GROUND CONNECTION

An easy access to chassis ground is provided at the rear of the recorder and is labelled "Chassis Ground". See Figure 2-2. This connection permits a quick and easy method to insure safety and reduce noise.

TABLE 2-1
PIN DESCRIPTIONS FOR EVENT MARKER AND CHART STOP CONNECTOR

Pin	Description	Pin	Description
1	Event 1 Left	7	Chart Remote (i.e., stop)
2	Event 1 Right	9 thru 12	Ground
3	Event 2 Left	13	ACC power (+5 volts @ 20 mA)
4	Event 2 Right	14	No Connection
5	Event 3	15	No Connection
6	Event 4		

REMOTE START/STOP FOR CHART

The TA240 Recorder also provides a remote stop for the chart (thermal array printer). Connect a wire to Pin 7 of the "Digital Input - TTL Level" connector on the rear panel of the recorder (see Figure 2-2). The input is pulled up to +5 volts so that either TTL or contact closures to ground can be used. When the line is pulled down (and held low for at least one millisecond), the chart stops.

ANALOG SIGNAL INPUTS

Two 24 pin connectors, one per channel, provide the analog signal input to the TA240 Recorder. The connectors are 24-pin, similar to IEEE-488 and are located in the lower right section of the recorder where the signal conditioners plug in (see Figure 2-1). Refer to Table 2-2 below for pin designations. (Two additional connectors are provided for in the optional Two Channel Extension. Refer to paragraphs below on *Two Channel Extension.*)

TABLE 2-2
PIN CONNECTIONS FOR ANALOG SIGNAL INPUT CONNECTOR

Pin	Description	Pin	Description
1	Signal IN A	13	Analog GND
2	Analog GND	14	/Reset
3	Signal IN B	15	Digital GND
4	No Connection	16	PSCTRLx
5	Digital GND	17	No Connection
6	-5 volts	18	SERCLK
7	Hold	19	SEROUTx
8	No connection	20	SERIN
9	+5 volts	21	+5 volts
10	Chassis GND	22	Chassis GND
11	+12 volts	23	+12 volts
12	AC1	24	AC2

ANALOG OUTPUTS

Analog outputs for the recorder are available on the "Analog Output" connector on the rear panel of the recorder. The outputs, which are the same as the outputs from the signal conditioners, are 2.5 volts full scale, single-ended to ground. Refer to Table 2-3 below for pin descriptions.

TABLE 2-3
PIN DESCRIPTIONS FOR ANALOG OUTPUT CONNECTOR

Pin	Description
1	Channel 1A
2	Channel 2A
3	Channel 1B
4	Channel 2B
5	No Connection
6 thru 9	Ground

SIGNAL CONDITIONERS

Installation and Removal

Two signal conditioners can be installed in the TA240 Recorder case (see Figure 2-1). (The optional Two Channel Extension module provides for two additional signal conditioners. See paragraphs below on installing the module.) To install the signal conditioner, position the slots on the four corners of the signal conditioner on the tracks in the signal conditioner case (see Figure 2-6). Slide the signal conditioner into the case until the latching plate on the top of the signal conditioner passes the release lever on the case and secures the signal conditioner in the case.

To remove the signal conditioner from the TA240 Recorder, press down on the release lever. The signal conditioner which is under spring tension will move slightly clearing the release lever. Grasp the signal conditioner at the sides and remove it from the case.

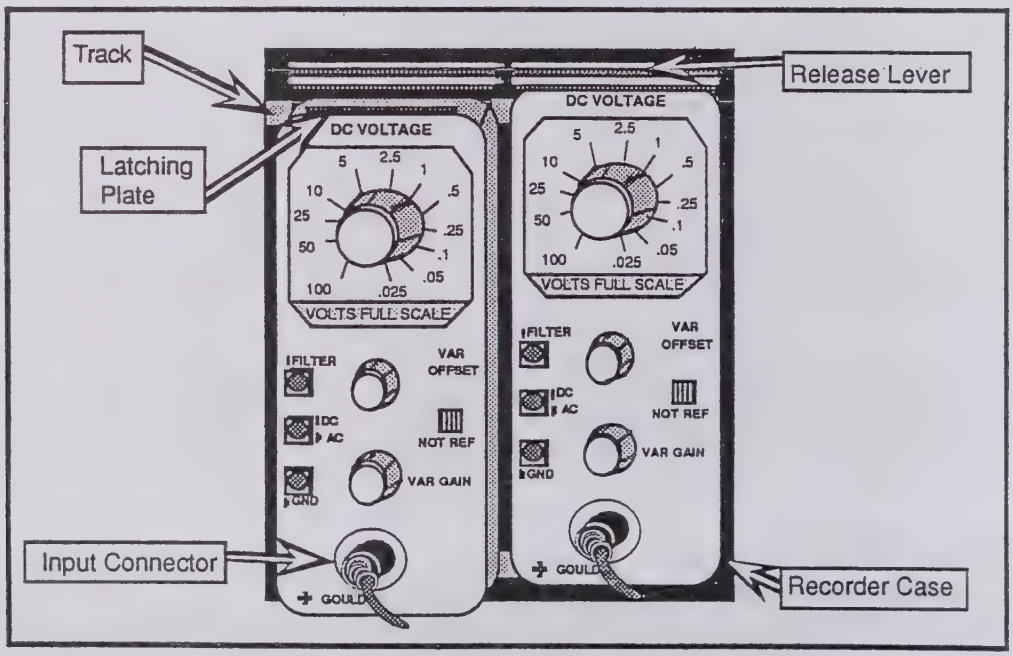

FIGURE 2-6
SIGNAL CONDITIONER INSTALLATION

LOADING CHART PAPER

The chart paper for the TA240 is fan-fold (Gould Part Number CL-213688) and is supplied in packs of 300 sheets, 45 meters (148 feet) with a width of 120 millimeters (4.75 inches). A window located on the front door of the thermal array printer gives an approximate indication of paper usage (see Figure 2-1). A tray is installed on the front of the recorder to store printed chart paper. See Figure 2-7 for an illustration of the major components of the printer. Four different types of grids for the paper can be selected via the Grid selection key (see Front Panel Keys, Operation Section). Refer to the procedure below for loading chart paper.

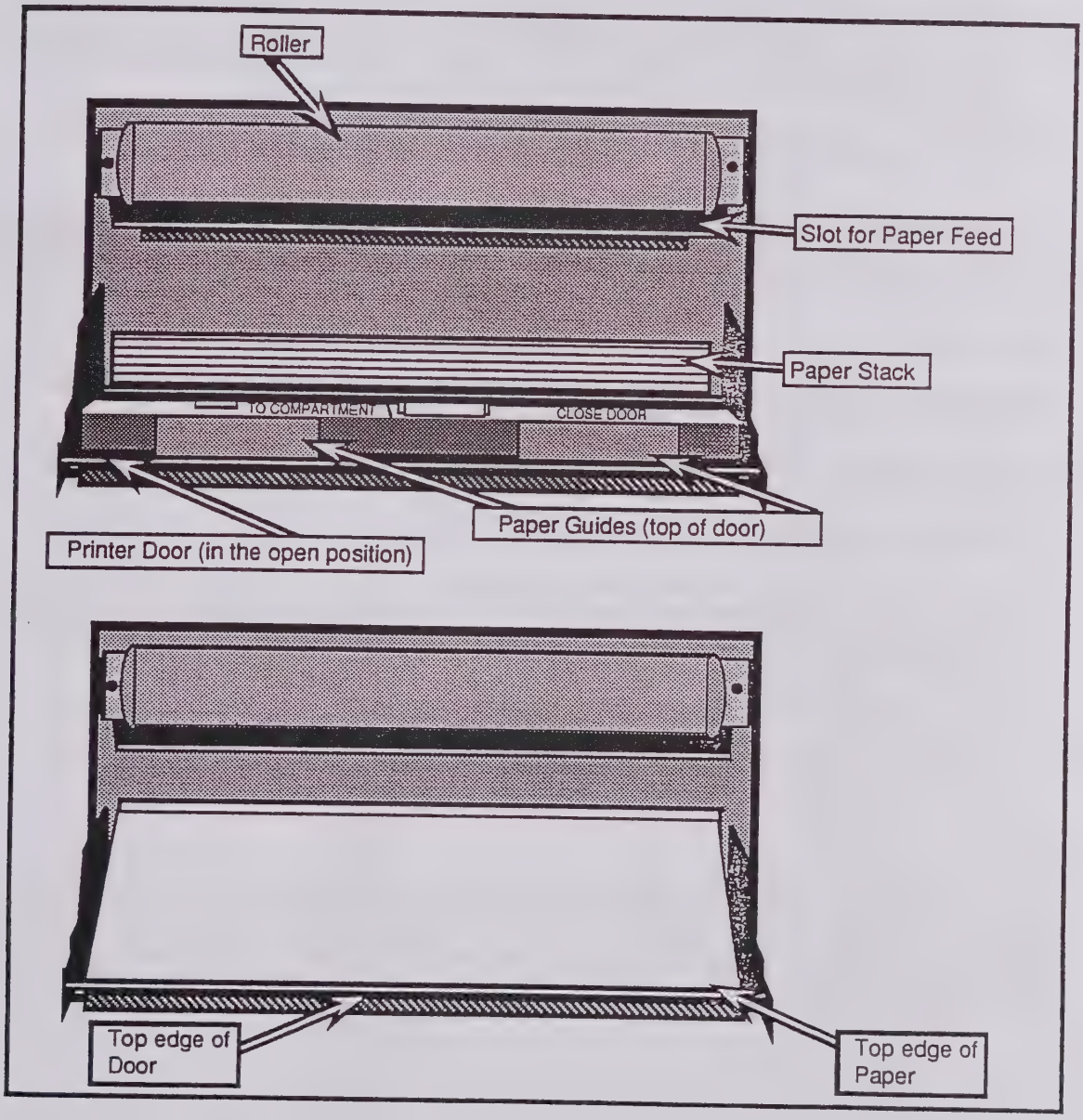

FIGURE 2-7
PAPER LOADING

Paper Loading Procedure

CAUTION

Chart paper should be loaded with power ON which resets page numbering to page 300. Page counter then decrements as paper is used.

1. Grasp the handle in the door of the printer and pull the door out allowing it to open completely. See Figure 2-7.

2. Place the stack of chart paper with the treated (shiny) side up into the paper compartment. The black square should be in the lower left-hand corner of the sheets as the stack is placed in the recorder. The black square indicates the side that the signals will be printed on. (The red line on the side of the paper represents the end of the paper and should be towards the bottom.)

3. Pull the top edge of the first sheet of paper out until it is even with the top edge of the door. The paper will cover the paper guides.

4. Close the door. The printer will automatically feed the paper through the slot under the roller and out the printer door. The printer runs automatically until two to three pages of paper are fed through the front of the door and stops, waiting for the printer operation to be enabled. (See *Front Panel Keys* in the Operation Section for enabling the printer and selecting grids.)

Cleaning The Drive Roller

In time, paper dust may accumulate on the drive roller making paper loading difficult. If excessive paper dust is present, clean the drive roller using the following procedure:

1. Grasp the handle in the door of the printer and pull the door out allowing it to open completely. Refer to Figure 2-7.

2. Remove the paper from the paper compartment.

3. Wipe the visible surface of the roller with a lint-free tissue or a tissure saturated, but not dripping with, alcohol solvent. (Use a low water content solution: 90% either reagent grade denatured ethanol or isopropyl alcohol is recommended.) Rotate the roller with your finger tips to expose the entire surface.

4. Remove any excess liquid by wiping with a dry lint-free tissue.

5. Allow the roller to air dry completely before reloading the paper.

QUICK START UP

For a quick start up of the recorder and to familiarize the user with the basic functions of the TA240 Recorder, refer to the *Recorder Applications* paragraphs which appear at the end of the **Operation Section**. However, it is suggested that the user start at the beginning of the Operation Section and become completely knowledgeable about all features, controls and menus of the TA240 before attempting any operation or tests.

TWO CHANNEL EXTENSION OPTION (Gould P/N 814223)

The TA240 offers an optional two channel module which provides for four channel operation. The two channel module can be used as stand-alone unit that is connected to the recorder with an one foot cable. or mounted on the side of the recorder with the hardware kit (with the same cable) that is part of the Extension module. The 9-pin connector at the rear of the module is analog output connector (see Table 2-4 below for pin .)

TABLE 2-4
PIN DESCRIPTIONS FOR ANALOG OUTPUT CONNECTOR

Pin	Description
1	Channel 3A
2	Channel 4A
3	Channel 3B
4	Channel 4B
5	No Connection
6 thru 9	Ground

If the unit is used as a stand-alone unit, plug the 37-pin cable into the right-side of the cable and install two screws on the connector to secure it. Plug the other end of the cable into the rear of the Two Channel Extension unit and secure it with two screws. To install the Two Channel Extension on the side of the basic TA240 recorder, refer to the procedure below.

Installing the Two Channel Extension on the side of the Recorder

1. Make certain that the power is turned off on the TA240 recorder. Position the extension module on the right side (facing the front of the recorder). See Figure 2-8.

2. Plug the connector and cable (one foot length) from the two channel extension into the 37-pin female connector on the right side of the recorder. Secure the connector with two screws. Table 2-5 lists the pin designations for this connector. Plug the other end of the cable into the 37-pin female connector at the rear of the Two Channel Extension case. Secure the connector with two screws.

TABLE 2-5
PIN CONNECTIONS FOR INTERFACE CONNECTOR

Pin	Description	Pin	Description
1	CH3OUT	20	AGND
2	CH4OUT	21	CH4ON-L
3	CH3ON-L	22	CH4POS
4	CH3POS	23	No Connection
5	AGND	24	No Connection
6	Digital GND	25	Digital GND
7	+5 volts	26	+5 volts
8	-5 volts	27	-5 volts
9	Digital GND	28	+12 volts
10	+12 volts	29	Digital GND
11	Digital GND	30	Digital GND
12	HOLD	31	AC2
13	AC1	32	No Connection
14	Digital GND	33	SEROUT3
15	Digital GND	34	SERIN
16	SEROUT4	35	PSCTRL3
17	SERCLK	36	RESET-L
18	PSCTRL4	37	No Connection
19	Digital GND		

3. Position one of the three stand-offs between the extension module and the recorder and insert one of the three bolts with lock washer through the recorder (middle of the signal conditioner area) into the module. The bolts screws into a standoff inside the extension module. Repeat this procedure with the other two stand-offs and bolts which are installed from the rear of the recorder (not from inside the signal conditioner area but at the outside edge of the rear panel).

4. Install the signal conditioners into the two channel extension module. (See the above paragraphs on *Installing and Removing Signal Conditioners.*)

5. Turn power on to the recorder and refer to the Operation Section for instructions. The Channel Position knobs on the module operate in the same manner as those on the recorder (i.e., the knobs have a range of 100% of the signal conditioner's full scale value, and the position can be locked into place with the outer knob ring.) To release and reposition the handle for the recorder, press the release knob on the left side.

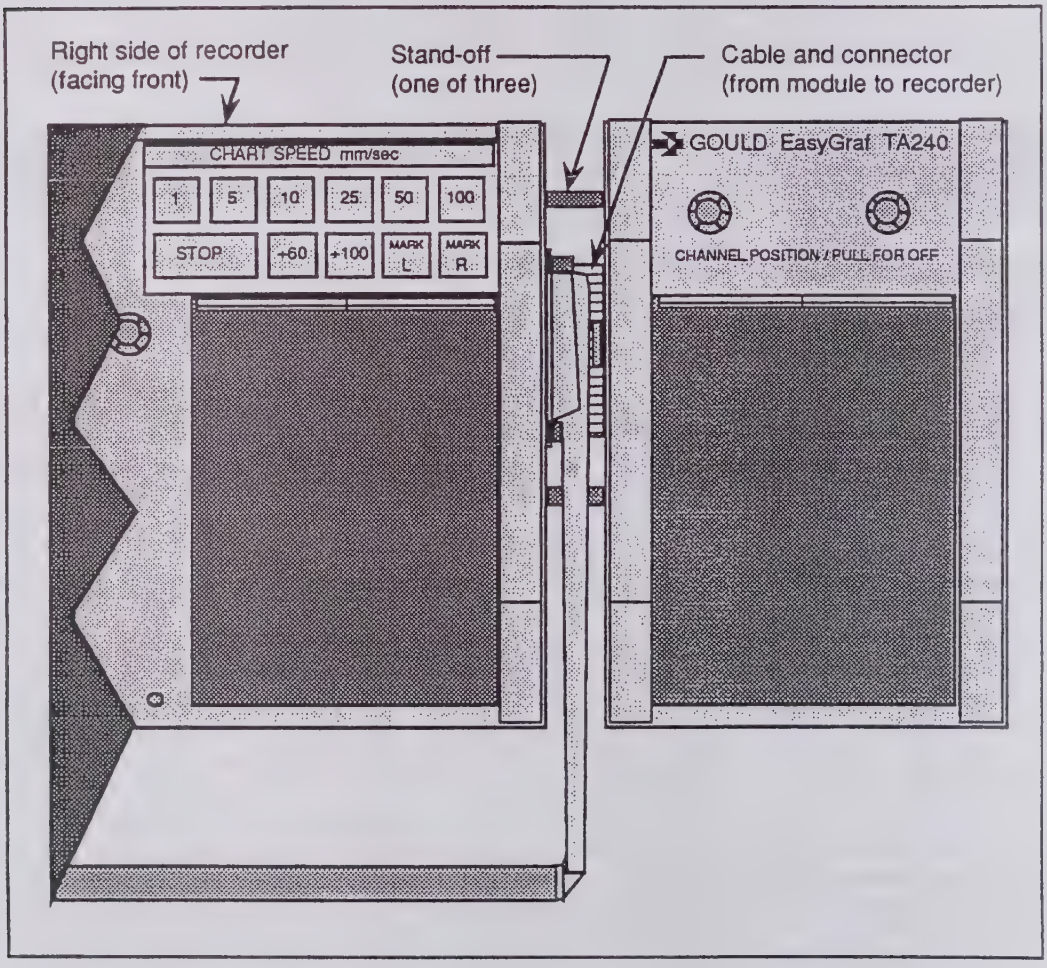

FIGURE 2-8
INSTALLING THE TWO CHANNEL EXTENSION ON THE SIDE OF THE RECORDER

OPERATION

INTRODUCTION

This section is organized to introduce the user to the equipment by describing the features and operation of the TA240 Recorder. These first paragraphs are intended to familiarize the operator with the unit and assumes that the user has installed the necessary signal conditioners and performed all required connections as outlined in the Installation Section of this manual. Figure 3-1 is an illustration of the TA240 Recorder and all of its major components. Should an error code (e.g. "E 0001") appear on the display window, refer to Appendix B for an explanation of the code.

Instructions for all the front panel buttons and keys are provided first. This introductory section allows the user to become completely knowledgeable with the front panel and menu keys which control all functions, primary and auxiliary, of the TA240. The front panel control keys which activate the principle or primarily used functions of the system are described first followed by instructions for operating the front panel keys (protected by the front panel door) which control additional functions of the TA240 (setting time and date, selection of the identification message and turning on grid patterns, event markers and annotation).

The Operation Section concludes with two applications using the recorder. This first is a simple start-up procedure using the TA240 only to record a few channels on chart paper. This application is intended only to familiarize the user with the basic functions of the recorder as well as to permit a quick startup of the instrument. The second application exercises some of the additional features of the recorder such as annotation, timer and event markers.

For operating instructions about the various signal conditioners used with the system, refer to the user's manual for the specific signal conditioner.

The Gould TA240 Recorder and Signal Conditioners are warranted to conform to the applicable published specifications in effect at the time of shipment, and to be free from any defects in material or manufacture.

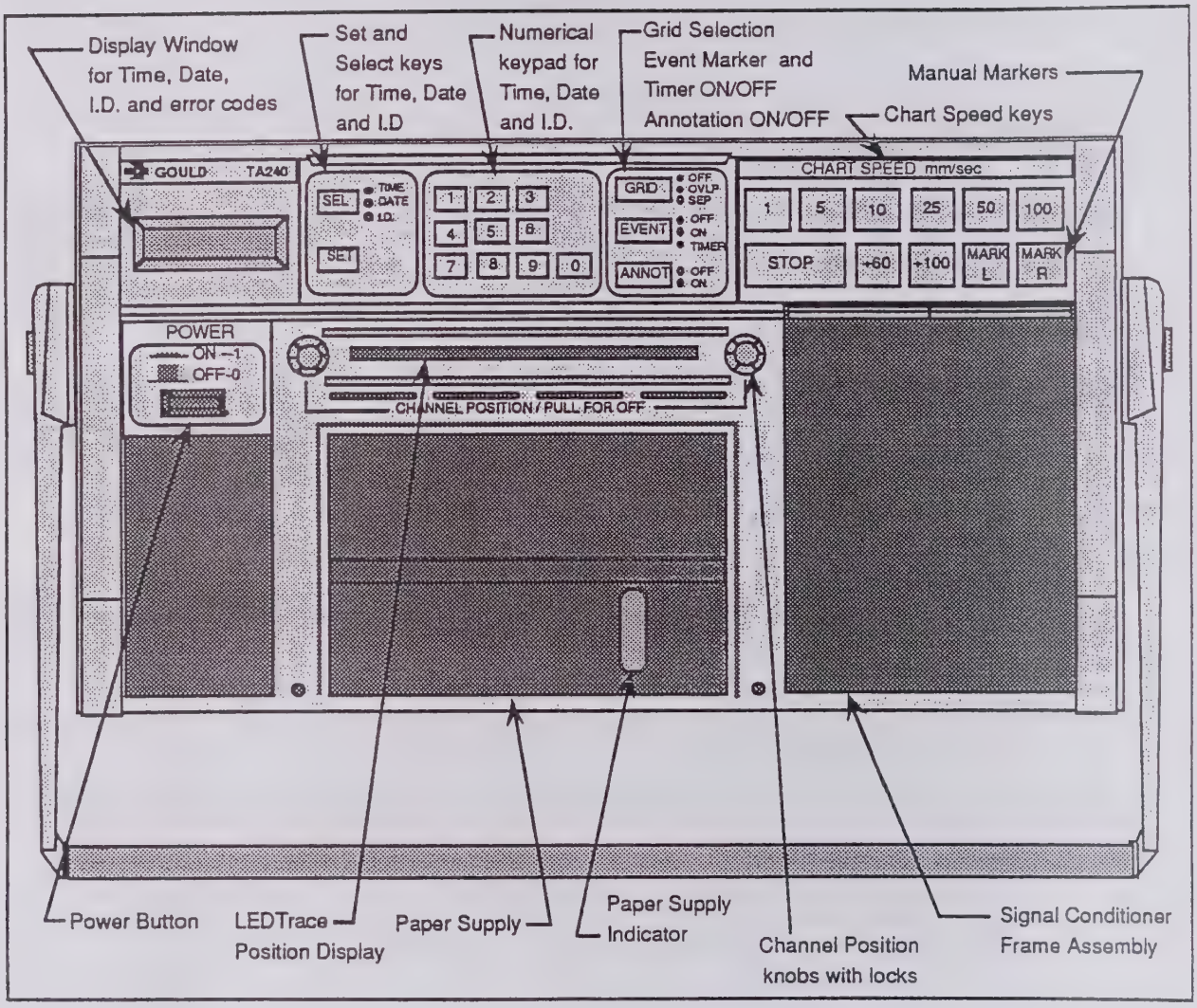

FIGURE 3-1
TA240 RECORDER

FRONT PANEL CONTROL KEYS AND KNOBS

The TA240 Recorder permits the user to perform all the operational functions with panel keys and knobs on the front panel. There are additional control functions available behind the upper panel door. However, once the initial setup has been performed most of the operation will be executed from the various panel keys (chart speed, event markers) and knobs on the front panel.

The front panel controls are laid out in four areas. The Power ON/OFF button is readily visible and accessible by its isolation to the left side of the unit. The Channel Position knobs which adjust the positioning of the signal traces are located directly above the printer. An LED array, located between the position knobs, allows the user to see whether the channel trace is on (as well as the size of the trace) or off. All operational functions (such as chart speed, event marker activation, identification message selection, and annotation) are controlled by panels keys above the printer. The following paragraphs are detailed descriptions of the front panel keys, knobs, and buttons. The user should become knowledgeable with these functions before attempting the typical application at the end of this section.

Power ON/OFF Button

Power to the unit is turned ON and OFF with the power button located on the left side of the unit. See Figure 3-1. When the button is pushed in, the unit is ON. When the TA240 Recorder is powered ON, the signal conditioners and channels all become active (i.e., power is connected and they only need to be enabled for operation).

Chart Speed Keys

The CHART SPEED keys control the speed of the thermal array printer and the printing of the waveforms on paper. Note that the STOP key for chart speed is larger so it is easily visible and accessible. If the STOP key is pressed after the chart is already stopped, the printer will form feed one sheet of paper. See Figure 3-2.

Chart speeds available with the front panel keys are 1, 5, 10, 25, 50 and 100 mm/sec. The two divide-by keys, ÷60 and ÷100, permit conversion to millimeter per minute and speed reductions as low as 0.01 mm/sec.. When the ÷60 function is used, the chart speed changes to millimeters per minute (and is printed as such, "mm/min," on the chart paper). The ÷100 function changes the selected speed to hundredths (e.g. 25 mm/sec to 0.25 mm/sec).

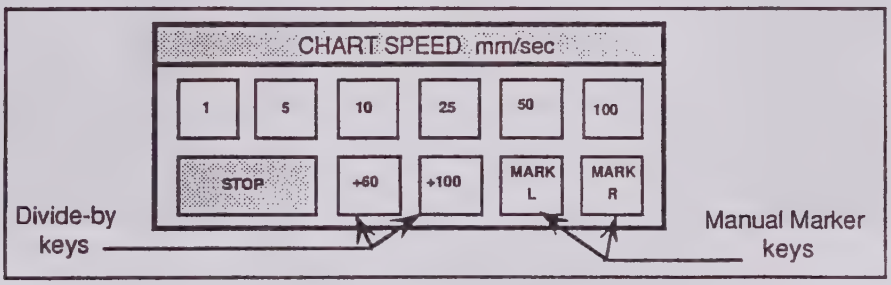

FIGURE 3-2
CHART SPEEDKEYS

Channel Position Controls

The Channel Position knobs located above the printer (see Figure 3-1) control the position of the waveforms on the the thermal array printer. The individual channels can be turned OFF by pulling the knob of the respective channel out (toward the user). The waveforms can be locked into position by turning the outer ring of the knobs (turning clockwise locks the position). The waveforms can also be overlapped by turning the inner knobs clockwise or counterclockwise. See Figure 3-3.

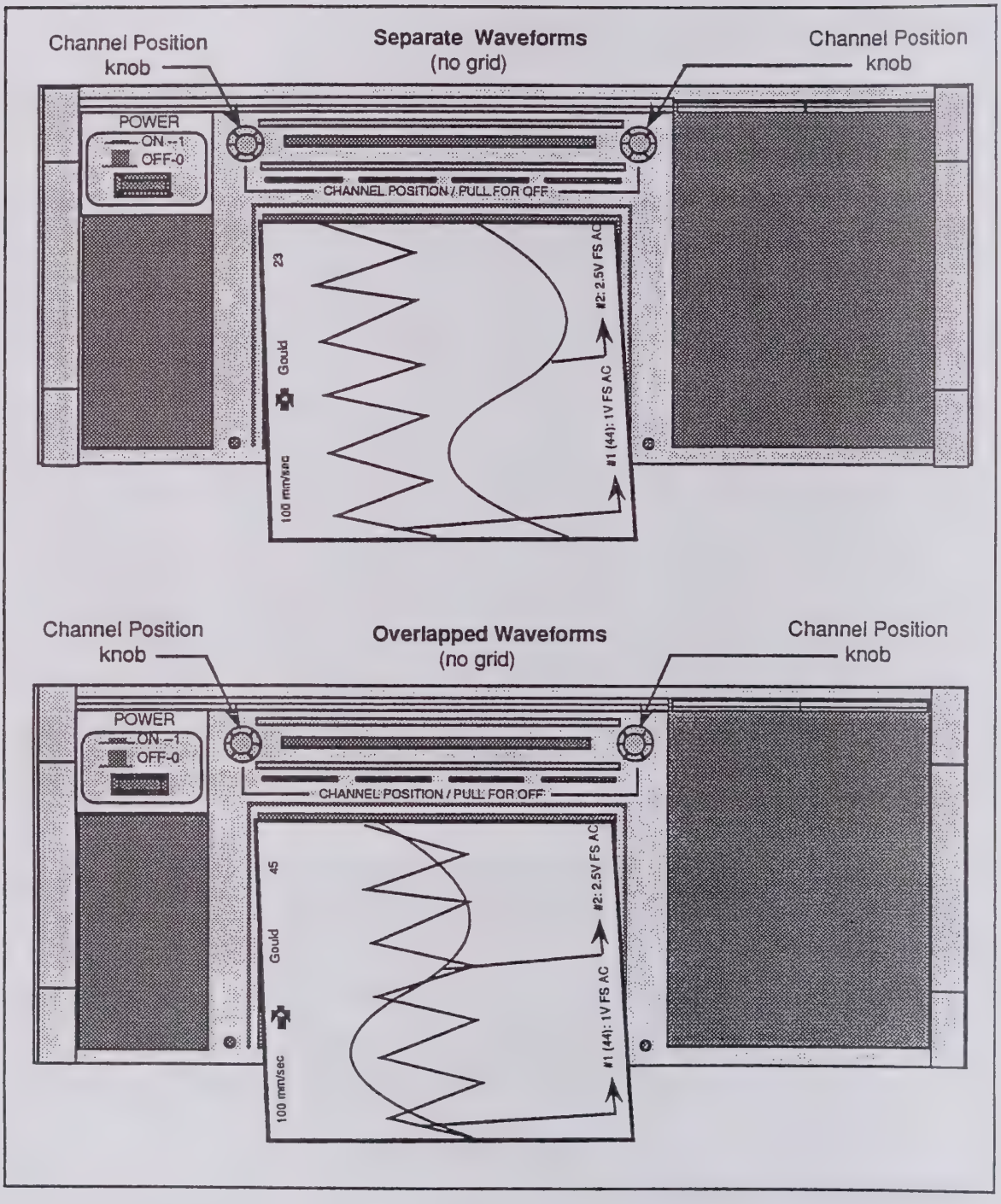

FIGURE 3-3
CHANNEL POSITIONING

Grid Selection

There are four grid types in which the recorder will print. The grid can be turned off with the *OFF* selection which provides a 100 mm, overlap print area; turned on with one single 100 mm grid area in the *OVLP* (overlap) mode; or the chart can be separated into two or four grid areas. See Figure 3-4. The single grid area is comprised of 10 major divisions with 10 minor divisions at 1 mm interval. To set the grid for the single area, press the *GRID* button until only the OVLP light is lit. The two separate 40 mm grid areas are printed at 10 major divisions with four minor divisions at 1 mm intervals; the four separate 20 mm grid areas are also 10 divisions with four minor divisions but at 0.5 mm intervals. To set the chart to a two grid area press the GRID key until the OVLP and SEP lights are lit. To print four separate grid areas, press the GRID key until only the SEP light is lit. Changes to grid can be made on the fly without pressing the STOP key. The chart will hesitate momentarily while the change is made and then resume speed.

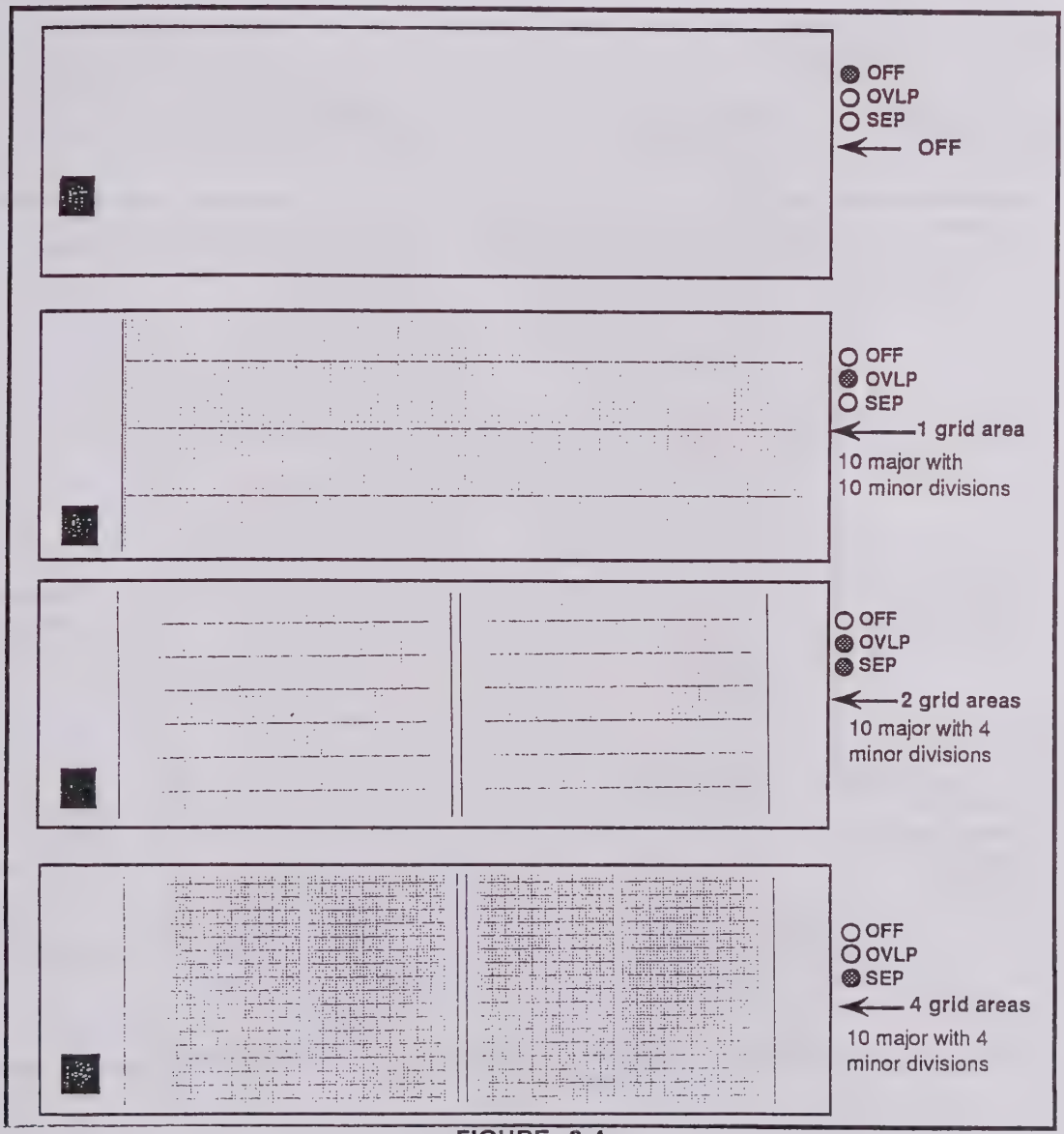

FIGURE 3-4
GRID SELECTIONS

Event Markers and Timer

The EVENT (event marker) key enables the event marker inputs. (The connections for the event marker inputs are on the rear panel. Refer to the **Installation** instructions in Section 2.) Either a TTL low or contact closure to ground is used to generate an event marker. There is no mark at +5 volts (or TTL high); a mark is produced at TTL low or contact closure. When the event occurs (and is held low for at least one millisecond), the paper is marked as wider vertical lines on one of the four (or one) event marker lines. Event 1 and 2 are bidirectional and are printed on the left and right side of the paper respectively. See Figure 3-5. Event 3 and 4 are unidirectional and appear in the middle of the paper. Only Event Marker 1 (or the Manual Markers) is printed in either overlap mode (one grid area) or with grid OFF.

In addition to the digital inputs, there are also two manual markers that are printed each time the MARK L or MARK R button is pressed. The manual events are printed on the same line as the Event Marker 1 on the left side of the paper. Whichever is last activated, Event 1 or the manual event, will be printed.

When the *Timer* function is activated by pressing the EVENT key until the LED labelled "TIMER" is lit, the chart will print the timer marks (at one second or minute intervals) and, if the annotation is activated, the time and date (e.g. "Units = sec, **04:40:09 Jan 31, 91**) on the bottom of the chart paper (or the right edge viewed from the recorder) on every other page. See Figure 3-5. The timing marks are printed at seconds except for speeds lower than 1 mm per second in which case the marks are printed at one minute intervals.

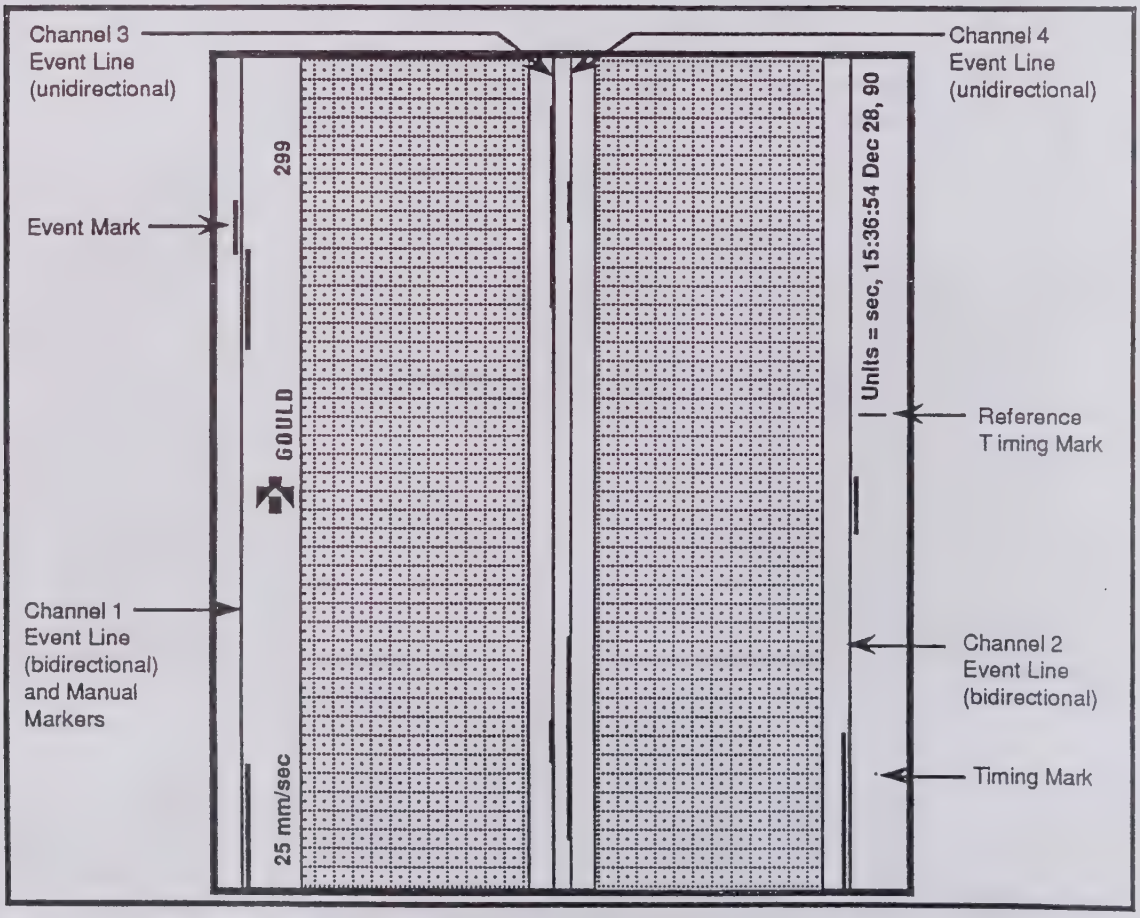

FIGURE 3-5
EVENT MARKERS

Annotation

The ANNOT (annotation) key turns ON or OFF the annotation items printed on the two edges of the paper. Annotation consists of the chart speed and page number printed on the left edge of the paper; time and date on the right edge; and channel identification with I.D. number and signal conditioner status on the right side of channel. See Figure 3-6. The page number begins with "300" when the door to the paper compartment is closed. (If the unit is powered-off, the last page number is retained in memory and the recorder will continue with the next consecutive number when the recorder is powered back on and begins printing.) The Identification number contains a maximum of five numbers and appears in parenthesis after the channel identification. (See paragraphs below for setting I.D. number.) The signal conditioner status consists of various functions such as the full scale value, mode, filter status, variable gain and offset, if any. For a desciption of signal conditioner status displays refer to the specific signal conditioner manual.

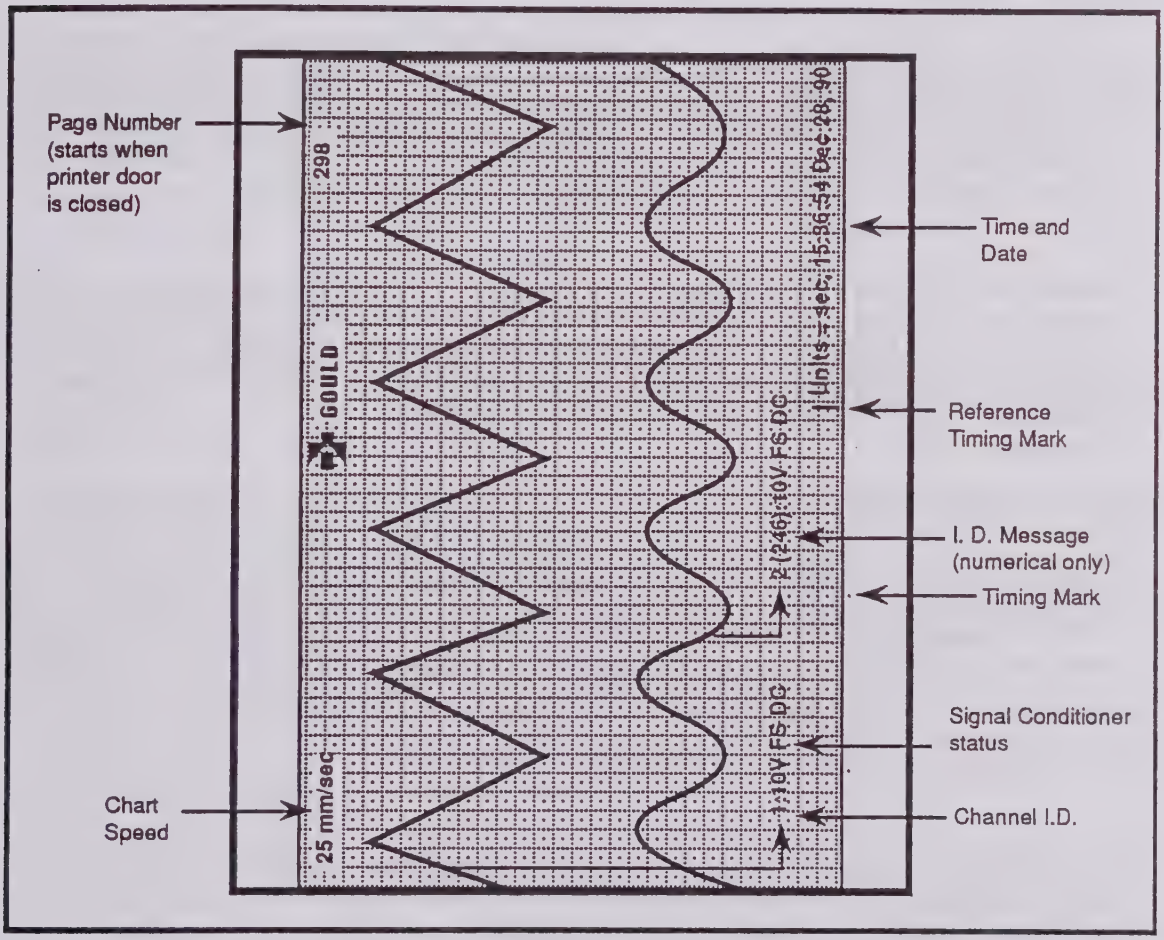

FIGURE 3-6
ANNOTATION
(Grid in Overlap mode)

Time, Date and I.D. Number

The SEL (select) and SET keys permit the user to first select the desired item (time, date or identification message) and then using the numerical keys to alter the selected item. The LED of the selected item is lit as the SEL key is pressed and the item (time, date, or identification message) is displayed. The battery backup system retains the last setting even if the recorder is powered off.

When the SET key is pressed, the display window is blanked and the corresponding LED blinks indicating the system is in the set mode. The user then enters the revised time, date, or identification message. See paragraphs below for entering specific items.

To print the timing marks (at one second or one minute intervals depending on chart speed), press the EVENT key until the TIMER LED is ON). To print the time and date, the annotation must be on by pressing the ANNOT key until the LED is ON. The I.D. number is also printed when the annotation is activated.

Time

Set the time by pressing the SEL key until TIME is selected. The LED for TIME will be ON and the last entered hour, minute, and second will be displayed in the window. To change the time, press the SET key. The LED for TIME blinks and the software blanks the display permitting the user to enter the new hour, minutes, and seconds using the numerical keypad. When the desired hour, minutes, and seconds have been selected, press the SET key again to enter the new time. If the SET key is pressed twice, the time field is set to zero (i.e., 00:00:00) and the clock can be used as an elapsed timer.

Date

Set the date by pressing the SEL key until DATE is selected. The LED for DATE will be ON and the last entered month, day, and year (in that order) will be displayed in the window. To change the date, press the SET key. The LED for DATE will blink and the software will blank the display permitting the user to enter the new month, day, and year using the numerical keypad. When the desired month,day, and year have been selected, press the SET key again to enter the new date.

Identification Number

To set the identification number, press the SEL key until the I.D. is selected and the LED is lit. The window will display the last identification number for the channel. The channel number is the first digit followed by the colon. To select another channel press the numerical key (from the numerical keypad) for the desired channel. (Numbers 5 thru Ø are ignored.) When the desired channel has been selected, press the SET button and enter the numerical identification number by pressing the desired numbers from the numerical keypad. A total of five numbers can be entered. See Figure 3-7. After the identification number has been entered, press the SET key again to store the number for that channel. For any other channels that must be changed, select the channel number and repeat the above procedure.

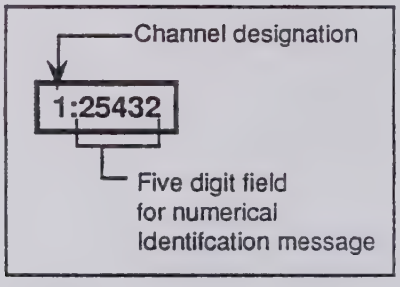

FIGURE 3-7
ENTERING IDENTIFICATION MESSAGE

QUICK START UP AND TYPICAL OPERATION

The TA240 Recorder requires only a few steps to start and operate. Make certain that all installation procedures have been performed as outlined in Section 2 of this manual (i.e., signal conditioner installation, loading paper and event marker and power cord connection). (For signal conditioner input connections refer to the specific signal conditioner manual.) Follow the instructions below to begin operation of the EasyGraf.

Start UpProcedure

1. Turn ***power*** on to the recorder by pressing the POWER button. See Figure 3-1. Time is displayed in the window.

2. Push in the ***channel position*** knobs. The LEDs for the channel positions will light. The channel position LEDs track the movement of the waveforms. The waveforms can be positioned to the desired location on the chart paper by turning the inner knobs in either direction. The outer ring of the channel knob locks the waveforms into position.

3. Select a ***chart speed*** from the front panel by pressing the desired chart speed key. (The divide-by keys provide speeds as low as 0.01 mm/sec.) The recorder will begin recording waveform data on the chart paper. The selected speed button will be lit.

4. ***Stop*** the chart and recording of data by pressing the STOP key. This completes the quick startup procedure. To use additional features on the recorder refer to the paragraphs below.

Typical Application

Once the above three steps have been accomplished, the recorder can be tailored for a specific operation by using the GRID, EVENT (event markers and timer), and ANNOT (annotation) keys located behind the front panel door. (See Figure 3-1.) The following example will set the time, date and I.D. message and enable the annotation, timer and event markers.

1. Four ***grid*** types are available for the TA240 Recorder: no grid, overlap, a two-grid area and four grid-area. To set the chart for two grid areas, press the GRID key until the OVLP and SEP lights are both lit.

2. To set the ***time***, press the SEL key until the LED for TIME is selected. The last entered time is displayed. Press the SET key which blanks the display and blinks the LED for TIME . Use the numerical keypad to enter the time as follows: 15:36:54 (hour:minutes:seconds). Press the SET key again to store the time in memory.

3. To set the ***date***, press the SEL key until the LED for DATE is selected. The last date entered is displayed. Press the SET key which blanks the display and blinks the LED for DATE . Use the numerical keypad to enter the date as follows: 12:25:90 (month:day:year). Press the SET key again to enter the date into memory.

4. Set the identification number by pressing the SEL key until the LED for I.D. is lit. The last number for ***I.D.*** is displayed. The first digit followed by a colon is the channel number. Select Channel 1 by pressing the number "1" on the the numerical keypad. (Numbers 5 thru Ø are ignored.) Press the SET button and enter the numerical identification number by pressing the following numbers from the numerical keypad: 61444. (A maximum of five numbers can be entered.) After the identification number is entered, press the SET key again to store the number for that channel. (To enter an I.D. for another channel, select the channel number and repeat the above procedure.)

5. Press the ***chart speed*** button for 25 mm/sec. The recorder will print the channel waveform on the chart paper. (If the "+100" key is pressed, the chart speed slows to 0.25 mm/sec; if the "+60" is pressed, the chart speed changes to millimeters per minute, 25 mm/min.)

6. Turn on the ***annotation*** by pressing the ANNOT (annotation) key. The recorder will print the chart speed and page number on the left edge of the paper; and channel identification with I.D. message and signal conditioner status on the right side of channel.

7. The ***event markers*** are enabled by pressing the EVENT key. (The digital inputs are connected at the rear of the recorder . See Installation Section.) In the two grid area which has been selected in this application, Event 1 and 2 (bi-directional) are printed on the left and right side of the paper respectively; Event 3 and 4 (unidirectional) appear in the middle of the paper. [Only Event Marker 1 (or the Manual Markers) is printed in either overlap mode (one grid area) or with grid OFF].

   In addition to the digital inputs, there are also two ***manual markers*** that are printed each time the MARK L or MARK R button is pressed. The manual events are printed on the same line as the Event Marker 1 on the left side of the paper. Whichever is last activated, Event 1 or the manual event, will be printed.

8. To activate the ***timer*** function press the EVENT key until the LED labelled "TIMER" is lit. The chart will print the timer marks and, if annotation is turned on, the time on every other sheet (e.g. Units = sec, 04:40:09 Jan 14, 91) on the bottom of the chart paper (or the right edge). The timing marks are printed at one seceond intervals except for speeds lower than 1 mm per second in which case the marks are printed at one minute interval. (If the EVENT key is pressed until the LEDs for "EVENT" and "TIMER" are lit, both evetns an timer marks are activated.) Figure 3-8 is an illustration of the above application.

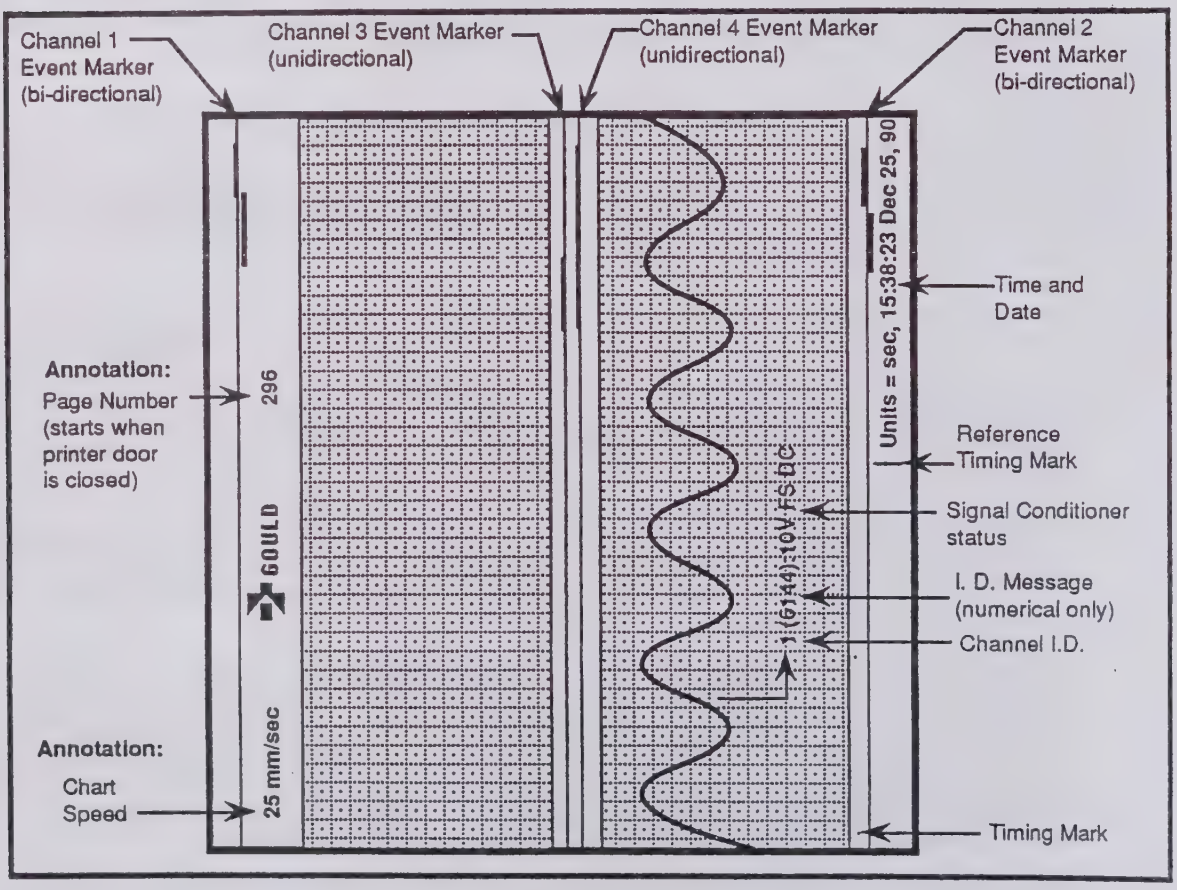

FIGURE 3-8
RESULTS OF APPLICATION EXAMPLE

SPECIFICATIONS, SUPPLIES AND ACCESSORIES

The following is a list of EasyGraf specifications:

Physical Characteristics

Dimensions..... 15.2 cm (6") height; 30.5 cm (12") width; 30.5 cm (12")depth.

Weight..... 9 kg (20 pounds) without signal conditioners but with a full pack of paper loaded.

Environmental

Temperature

Operational ..... 5 to 45°C (41-113°F)

Stored ..... -40 to 85°C

Relative Humidity:

Operational ..... 10% to 90%.

Stored ..... 5% to 90%.

Shock and Vibration..... Unit vertical acceleration limit 30G. Meets and exceeds IEC-348 paragraph 11.2 (Drop Test) and 11.3 (Vibration) as well as MIL.STD 810D Commercial Transportation.

Power Requirements

Voltage AC

Model 42-8240-10..... 100 VAC, 50/60 Hz.
120 VAC, 50/60 Hz.
220 VAC, 50/60 Hz.
240 VAC, 50/60 Hz.

Model 42-8240-40..... 100 VAC, 50/60/400 Hz.
120 VAC, 50/60/400 Hz.
220 VAC, 50/60/400 Hz.
240 VAC, 50/60/400 Hz.

Voltage DC..... 12 to 30 VDC at 15 amps peak. Minimum start-up voltage is 11.0 volts. (Once started, the unit will operate at its full operating range of 10 to 30 volts.)

Safety/Emission ..... Designed to meet UL, CSA, TUV, and VDE certification.

Line Voltage Selection..... AC selected by voltage switch drum located in voltage input module.

Emission..... Designed to meet FCC Rules CFR 47 Part 15, subpart J - Class A (FCC Rules- Emission) and VDE Class A emissions test requirements.

Analog Signal Inputs

Connector	24 pin (similar to IEEE-488 type), one per channel.
Frequency Response	DC to 500 Hz full scale flat ±2%.
DC Linearity	flat within ±0.2% of full scale
Voltage Input	±1.25 volts full scale.

Analog Outputs

Connector	9-pin located on the rear of recorder as well as the optional Two Channel Extension.

Sampling

Type	Single, multiplexed, 12 bit A/D.
Linearity	±0.05% full scale (±1 bit or 1.25mv).
Sampling Rate	20 kHz, 5 kHz per channel
Timebase Inaccuracy	1%, worst case.
Channel to Channel Sampling Skew	50 µsec ±0.05% , maximum.
System Amplitude Inaccuracy	Add 0.05% full scale (worst case) to signal conditioner inaccuracy (% full scale).

Thermal Array Printer and Paper

Writing Method	Direct thermal array. X-axis, 8dots/mm; y-axis, 32 to 8 dots/mm.
Chart Width	4.09 in. (104 mm).
Paper Type	Fan fold only, 300 sheets, 148 ft. (45 meters) maximum with 4.75 in. (120 mm) width.
Chart Speed	0.01 to 100 mm/sec and STOP.
Speed Accuracy	within 2% of indicated speed
Chart Wander	±1 mm after paper is correctly loaded and aligned.
Observable Amplitude Resolution	0.16% full scale (10 bits or 4mv).
Print Head Life	30 km of paper or 30 million pulses, typical.
Paper Indicator	"Paper Out" sensor as well as a visual indicator of approximate level of paper and a red bar on the right edge of paper to indicate a paper low condition.
Over Temp Protection	All printing ceases when the print head exceeds its safe operating temperature.

Digital Inputs

Event Markers ..... six TTL low true inputs on rear of unit.

Minimum Pulse Width..... 1 msec.

Remote Stop..... TTL low true input on rear of unit.

SUPPLIES

Item	Gould Part Number
Chart Paper.....	CL-213688

ACCESSORIES

Battery Pack.....	CL-814224
Two Channel Extension.....	CL-814223
Rack Mount Kit - 2 Channel.....	CL-814593-1
Rack Mount Kit - 4 Channel.....	CL-814593-2
DC Power Input Cable with cigarette lighter plug	CL-614592
Separate Battery Charger.....	CL-714591

ERROR CODES

Table B-1 is a list of error codes, the definition of each code and the solution. Error codes appear in the display window (see Figure 3-1) and are preceded by an "E", e.g. "E 0001".

TABLE B-1

Code	Problem	Solution
0001	Printer door open	Close printer door
0002	Out of printer paper	Add paper
0004	Printer disabled	Turn recorder off and then on. If problem persists after repeating procedure, call Gould Service Rep.
0010	Printer Overheating	Turn recorder off for at least two minutes and restart. If problem persists after repeating procedure, call Gould Service Rep.
0016	Stored information has been lost.	Enter stored information (e.g., I.D. number) again.
0017	Stored information has been lost.	Enter stored information (e.g., I.D. number) again.
0018	Stored information has been lost. System defaults loaded.	System defaults are loaded for stored information. Re-enter desired parameters (e.g. I.D. number) for stored information.
0098	Paper loading error	Reload paper per instruction in Installation Section. If problem persists, call Gould Service Rep.
0099	Printer disabled because of a system error.	Turn recorder on and off. If problem persists after repeating procedure, call Gould Service Rep.
0100	Low Power Voltage (e.g., battery voltage low)	Connect to specified power input.
1002 thru 1085	System errors	Turn recorder off and restart. If error returns, call Gould Service Rep.

Gould instruments are individually tested and calibrated before shipment to assure dependability and verify their accuracy. To this procedure must be added an unseen ingredient of prime importance to you: the Gould concept of continuing service. Gould responsibility for each instrument sold covers far more than its delivery. Of equal concern is the equipment's suitability for its intended purpose, its correct installation, instruction of operating personnel -- plus future servicing and maintenance. The Gould Field Service Department offers customers any or all of these service:

Field Service

Installation
Field maintenance
NIST Certification

Training

Instruction of operators
On-site training seminars
Formal Training courses

Service Contracts

Fixed Fee
Time and Material
Extended Warranty

Our Seal of Pride

Gould Inc., Test and Measurement Group and its predecessor organizations tracing back to Charles F. Brush, have been preeminent in instrumentation development since the 1920s. Among Gould's many achievements is a series of the world's best performing, most versatile, and reliable direct writing recording systems.

Today, Gould recorders and signal conditioners are the overwhelming choice for recording analog signals in the most critical industrial, scientific, and biophysical measurement applications. Whether recording the faintest life signals of a patient in a hospital operating room or the most critical variables in the laboratory or on the production line, you can expect accuracy, dependability, clarity, and permanence of the traces made by any Gould Recording System. Innovative design, coupled with highest quality, are hallmarks of all Gould products.

The Field Service Engineer

Gould field service engineers provide on-the-spot assistance whenever and wherever it is required. While every field service engineer is the product of intensive and thorough factory training, you will find that his greatest strength evolves from field experience and his knowledge of your objectives. He is aware of your problems, is willing and able to assist you in their solution, and is backed by the nation's most experienced organization in recording instrumentation.

Our field service engineers and technicians are daily engaged in the installation, testing, maintenance, repair and inspection of Gould recording systems all over the country. They can quickly provide you with any information about our instruments you may require; if not, they will find the answer to your problem.

Overhaul and Repair

Because we service only our own products, our customers can feel confident of prompt, effective results when they turn to Gould Factory Service Centers.

The repair service these centers provide is of particular appeal to those companies that do not operate an instrument repair facility of their own. By designating the nearest Gould Service Center as its maintenance depot, a Gould-equipped company is assured the best chance for continuous operation.

The Replacement Parts warranty is ninety (90) days from date of delivery.

Many companies with their own repair facilities find it more convenient and more truly economical to have their Gould equipment repaired by service contract with the closest Service Center. In addition to enjoying fast turn-around, these companies are spared the expense of carrying an inventory of recorder parts, accessories, and supplies.

Calibration and Certification

A small, quiet room in the Standards and Calibration Section at the Gould plant in Valley View, Ohio contains precision reference standards just one step removed from the prime reference measurement standards of the United States National Institute of Standards and Technology in Washington. Included in this room, which is temperature-controlled within one degree and has a constant relative humidity of 40%, are standards for voltage, frequency (derived from the atomic vibration of caesium), resistance, capacitance -- in fact all basic parameters of electrical measurement. The room is maintained under stabilized conditions 365 days a year.

The calibration practice of all Gould Service Centers is directly traceable to the National Institute of Standards and Technology. We can supply complete calibration for any Gould equipment, and we can also certify to manufacturer's specifications followed by a letter of certification when required.

Training

The Gould field service engineer will hold short training courses either on the job or at his facility. On-the-job training is usually a brief, informal session with the people who will actually be operating the Gould equipment.

Formal classroom training is more complete: detail information, a thorough review of underlying theory, training devices, demonstration of problem solving and examination of students to determine their understanding and proficiency is accomplished at our Valley View, Ohio plant.

Contracts

Gould offers an Extended Warranty Agreement for all its products, along with calibration traceable to NIST. Please contact the Service Center listed on the following pages for details before your warranty expires.

Companies of customers requiring temporary or permanent service are afforded contractual arrangements by which agreed-upon maintenance, repair upgrading and calibration services are performed on a routine basis. Service contracts are now in effect with a number of customers, affording substantial saving in time and money.

Owing to the various requirements of each customer, we do not reproduce here a standard, boilerplate agreement -- which might contain too much or too little. Instead, we tailor each contract to a particular customer's needs. This practice has single-handedly produced substantial savings in time and money for others; and it can do the same for you.

An extended warranty is available at the point of sale allowing a regulated budget for the first two years of ownership. You may take advantage of this warranty within the first year of ownership at a percentage of the current listed price.

ARIZONA
***Phoenix**
8777 E. Via de Ventura, #100
Scottsdale, AZ 85258-3344
Phone: (602) 990-8212
Fax: (602) 443-8286

CALIFORNIA
Los Angeles
16310 Arthur Street
Cerritos, CA 90701
Phone: (213) 404-1919
Fax: (213) 404-1635
TWX: (910) 583-1365

San Francisco
3777 Depot Road, Suite 418
Hayward, CA 94545
Sales Phone: (415) 293-1400
Service Phone: (415) 293-1402
Fax: (415) 293-1407
Modem: (415) 293-1408

COLORADO
Denver
8480 East Orchard Road
Suite 1200
Englewood, CO 80111
Sales Phone: (303) 694-2111
Service Phone: (303) 694-6936
Sales Fax: (303) 694-1109
Service Fax: (303) 694-0252

DISTRICT OF COLUMBIA
6301 Ivy Lane
Suite 106
Greenbelt, MD 20770
Phone: (301) 345-0050
Fax: (301) 345-2850

FLORIDA
Orlando
7648 Southland Blvd., Suite 103
Orlando, FL 32809
Phone: (407) 438-5161
Fax: (407) 438-5167

GEORGIA
Atlanta
5555 Oakbrook Parkway
Suite 605
Norcross, GA 30093
Sales Phone: (404) 368-2170
Service Phone: (404) 368-2175
Fax: (404) 368-2184

ILLINOIS
Chicago
Suite 113 Box 5
2900 West Golf Road
Rolling Meadows, IL 60008
Sales Phone: (708) 640-4135
Service Phone: (708) 640-4378
Fax: (708) 640-4584

MASSACHUSETTS
Boston
216 W. Cummings Park
Woburn, MA 01801
Phone: (617) 938-0133
Fax: (617) 938-3710

MISSOURI
***St Louis**
Phone: (314) 984-0588
Fax: (314) 984-9279

MICHIGAN
Detroit
32307 Mally Road
Madison Heights, MI 48071
Sales Phone: (313) 588-4020
Service Phone: (313) 588-4024
Fax: (313) 588-4461

NEW YORK
Metropolitan New York
405 Murray Hill Parkway
East Rutherford, NJ 07073
Phone: (201) 935-1717
Fax: (201) 935-6945

NORTH CAROLINA
***Greensboro**
P. O. Box 16212
Greensboro, NC 27406
Phone: (919) 275-1978

OHIO
Cleveland
8333 Rockside Road
Valley View, OH 44125-6104
Sales Phone: (216) 328-7256
Service Phone: (216) 328-7175
Fax: (216) 328-7404

Dayton
432 Windsor Park Drive
Centerville, OH 45459
Sales Phone: (513) 433-9586
Service Phone: (513) 433-9606
Fax: (513) 433-2764

PENNSYLVANIA
Pittsburgh
3245 Old Frankstown Road
Pittsburgh, PA 15239
Sales Phone: (412) 327-7450
Service Phone: (412) 327-7451
Fax: (412) 327-7434

TEXAS
***Dallas**
8214 Westchester, #500
Dallas, TX 75225
Phone: (214) 691-8048
Fax: (214) 691-4176

Houston
10500 Northwest Freeway
Suite 209
Houston, TX 77092
Sales Phone: (713) 680-1121
Service Phone: (713) 680-3995
Fax: (713) 680-9653

WASHINGTON
***Seattle**
Phone: (206) 882-7525
Fax: (206) 882-7514

CANADA

Montreal, PQ
Interfax Systems Inc.
5575 St. Francois
St. Laurent, PQ H4S 1W6
Phone: (514) 336-0392
Fax: (514) 336-9607

Toronto, ON
Interfax Systems Inc.
45 Voyager Court N.
Rexdale, ON M9W 4Y2
Phone: (416) 674-8970
Fax: (416) 674-8986

Ottawa, ON
Interfax Systems Inc.
235 Stafford Road
Bay 103
Nepean, ON K2H 9C1
Phone: (613) 726-8888
Fax: (613) 820-3213

Vancouver, BC
Interfax Systems Inc.
3700 Gilmore Way, Ste 304
Burnaby, BC V5G 4M1
Phone: (604) 430-1410
Fax: (604) 430-3035

* Sales Only

EUROPE

AUSTRIA
Gould Electronics
Handelsges.m.b.H.
Mauerbachstrasse 24
A-1140 Wien
Telephone: 43-1/972506-0
Telefax 43-1/972506 38
Telex 1-31380

FRANCE
Gould Electronique
57 Rue Saint Sauveur
91160 Longjumeau
Adresse postate: B. P. 115
91162 Longjumeau Cedex
Telephone: (1) 69.34.10.67
Telex: 600824
Facsimile: 33-1-6934-2073

GERMANY
Gould Electronics GmbH
Waldstrasse 66
D-6074 Dietzenbach
Telephone: 49-6074/4908-0
Telex: 4 197 644 gou d
Telefax: 49-6074/4908-48

UNITED KINGDOM
Gould Electronics Ltd.
Roebuck Road
Hainault, Ilford
Essex IG6 3UE, England
Telephone: 44-81-500-1000
Telex: 851-263785
Telecopy: 44-81-501-0116

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